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Title: An improved feed mechanism for a medical device.

DESCRIPTION

The present invention relates to an improved feed mechanism for a medical device, particularly but not exclusively a syringe driver or pump.

Syringe drivers or pumps are well known. They are small, lightweight, battery operated machines that are designed to administer subcutaneous infusions of a prescribed amount of medication over a given period. A syringe driver basically consists of the machine itself, a syringe containing the medicine to be administered which is attached to the machine and a thin piece of tubing attached to the syringe which has a needle at the end of it. Syringe drivers are often provided with both the machine and the syringe contained within a housing to increase the portability of the device.

The drive mechanism for driving the plunger through the syringe barrel to dispense medication generally consists of a motor, gears and a threaded shaft. The motor causes rotation of the threaded shaft which, via an actuator attached thereto, effects movement of the plunger (for example, see US 5,006,112). Once the required medication has been dispensed, it is necessary to manually reset the syringe driver by pulling back the actuator and syringe plunger to the required degree. Conventionally, this is achieved by the provision of two half nuts around the threaded shaft, the

manual disengagement of which enables the actuator to be moved back to the end of the shaft to allow the plunger to be reset. However, these nuts are subject to a large amount of wear and tear and thus require frequent replacement. Furthermore, once the nuts have become worn, the shaft will still rotate placing a load on the motor but without imparting any movement to the actuator.

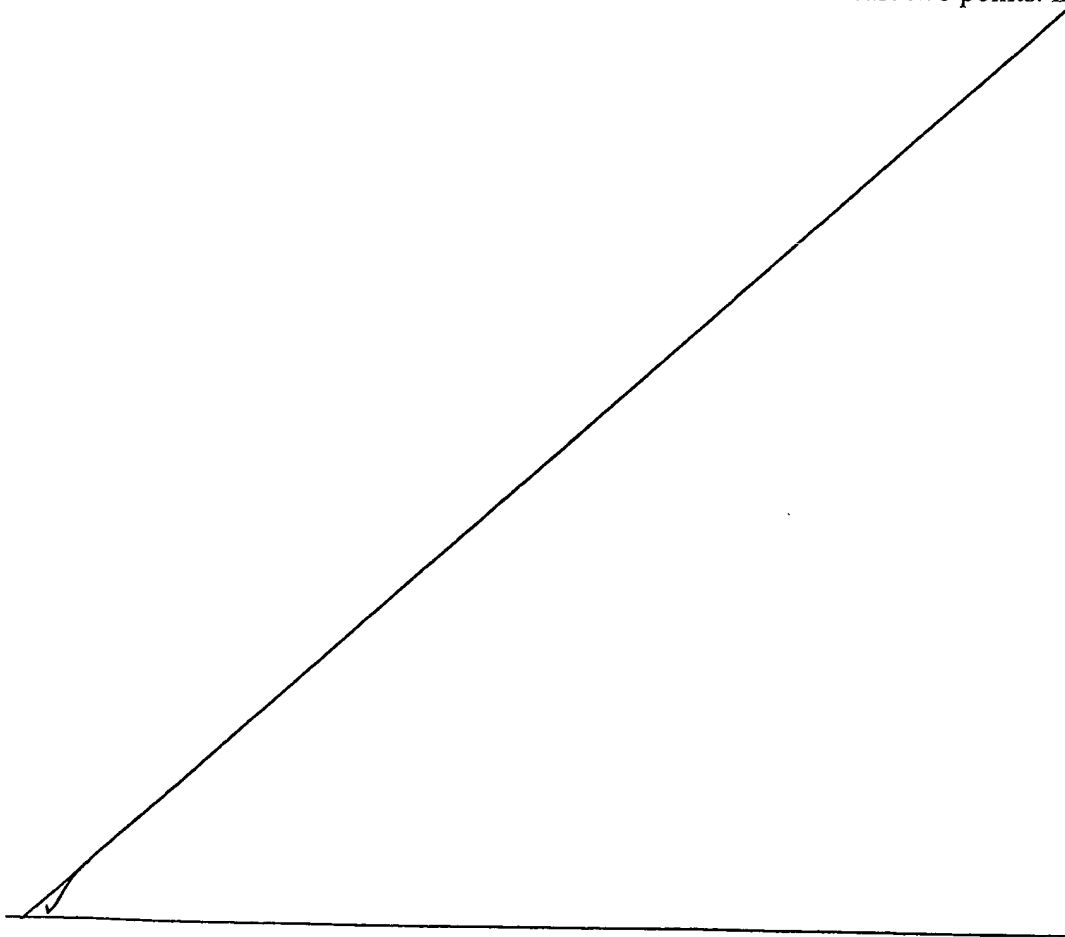
It is an object of the present invention to provide an improved feed mechanism for a medical device, particularly but not exclusively a syringe driver or pump that aims to overcome, or at least alleviate the abovementioned drawbacks.

Accordingly, a first aspect of the present invention provides a syringe driver assembly comprising driver means for imparting translational movement to a syringe plunger, the driver means comprising a motor driven unthreaded shaft, at least one bearing mounted obliquely to the shaft and having at least one point of contact therewith, and an actuator linked to the at least one bearing for contacting a thumb plate of the plunger wherein rotation of the shaft causes movement of the at least one bearing along the shaft to affect movement of the actuator.

If only a single bearing is provided, the shaft should be supported at one or more points along its length by a rotary member. The rotary member should be provided on the opposite side of the shaft to the contact point of the bearing.

However, in a preferred embodiment, more than one bearing is mounted obliquely to the shaft, especially three bearings, each having a bore through which the shaft extends. More preferably, alternate bearings are set at the same angle relative to the shaft and adjacent bearings are set at an opposing angle relative to the shaft. The bore of each bearing should be larger than the outer circumference of the shaft to result in each bearing being oversized with respect to the shaft, thereby creating clearance between the shaft and each bearing.

The inner profile of the bearings may be flat or pointed. Preferably, bearings having a flat inner profile with a chamfered inner race are used, each bearing being angled with respect to the shaft such that it contacts the shaft at at least two points. In



CLAIMS

1. A syringe driver assembly comprising driver means for imparting translational movement to a syringe plunger, characterised in that, the driver means comprising a motor driven unthreaded shaft (200), at least one bearing (260, 270, 280) mounted obliquely to the shaft and having at least one point of contact therewith, and an actuator (800) linked to the at least one bearing for contacting a thumbplate of the plunger wherein rotation of the shaft causes movement of the at least one bearing along the shaft to affect movement of the actuator.
2. A syringe driver assembly as claimed in claim 1 wherein a single bearing is provided and the shaft is supported at one or more points along its length by a rotary member.
3. A syringe driver assembly as claimed in claim 2 wherein the rotary member is provided on an opposite side of the shaft to the contact point of the bearing.
4. A syringe driver assembly as claimed in claim 1 wherein at least three bearings (260, 270, 280) are provided with alternate bearings (260, 280) being mounted at the same angle relative to the shaft (200) and adjacent bearings (260, 270) being mounted at an opposing angle relative to the shaft.
5. A syringe driver assembly as claimed in any one of claims 1 to 4 wherein each bearing has a bore through which the shaft passes, the bore being larger than the outer circumference of the shaft.
6. A syringe driver assembly as claimed in claim 5 wherein the bearing has a pointed inner profile.

7. A syringe driver assembly as claimed in claim 5 wherein the bearing has a flat inner profile with a chamfered inner race.
8. A syringe driver assembly as claimed in claim 7 wherein each bearing is angled with respect to the shaft such that it contacts the shaft at at least two points.
9. A syringe driver assembly as claimed in any one of claims 4 to 8 wherein three bearings are provided, the outer bearings contacting the bottom of the shaft and the central bearing contacting the top of the shaft or vice versa.
10. A syringe driver assembly as claimed in any one of the preceding claims wherein the angle of inclination of each bearing (260, 270, 280) relative to the shaft (200) is less than 45 degrees.
11. A syringe driver assembly as claimed in any one of claims 1 to 4 wherein the inclined bearings are symmetrically spaced in one plane perpendicular to the shaft axis, the outer races of the bearings making radial contact with the shaft.
12. A syringe driver assembly as claimed in claim 12 wherein the bearing is spring loaded.
13. A syringe driver assembly as claimed in any one of the preceding claims wherein the or each bearing (260, 270, 280) is housed within a carriage (400) that is moveable with respect to the shaft (200).
14. A syringe driver assembly as claimed in claim 12 wherein the carriage (400) is connected to the actuator (800).
15. A syringe driver assembly as claimed in claim 14 wherein the carriage is provided with guides.

16. A syringe driver assembly as claimed in any one of the preceding claims wherein the means is provided for manually disengaging the at least one bearing (270) to enable it to slide independently of the shaft (200).
17. A syringe driver assembly as claimed in claim 16 wherein a bearing is spring-loaded with respect to the shaft whereby operation of the spring mechanism disengages the bearing from the shaft.
18. A syringe driver assembly as claimed in claim 16 wherein manual disengagement is affected by movement of a housing (370) containing a bearing (270) in a direction transverse to the shaft to lift the bearing from the shaft.
19. A syringe driver assembly as claimed in claim 18 wherein a cam (500) and lever is used.
20. A syringe driver assembly as claimed in any one of claims 1 to 15 wherein automatic means is provided for reversing the direction of travel of the bearings and actuator along the shaft.
21. A syringe driver assembly as claimed in any one of the preceding claims wherein the bearing is provided with adjustable biasing means (502, 504, 506).